



May 28<sup>th</sup> 2021

PORTUGUESE LIFE TABLES 2018 - 2020

## LIFE EXPECTANCY WAS 81.06 YEARS AT BIRTH AND 19.69 YEARS AT AGE 65

In the 2018-2020 triennium, **life expectancy at birth** was estimated at 81.06 years, and men and women could expect to live up to 78.07 years and 83.67 years, respectively. Compared with 2017-2019, it represents an increase of about 1 and a half months for men and 2 months for women.

Within a decade, there was a gain of 1.77 years of life for the total population, 1.90 years for men and 1.48 years for women. This increase in female life expectancy at birth resulted mainly from a reduction in mortality among those aged 60 years and over. For men, these gains continued to be mainly due to the decrease of mortality below 60 years.

**Life expectancy at age 65**, in the period 2018-2020, attained 19.69 years for the total population. Men aged 65 years could expect to live 17.76 years, and women aged 65, 21.11 years, which corresponds to an increase of 0.06 and 0.11 years, respectively, compared with 2017-2019. In the last ten years, life expectancy at age 65 has increased 1.02 years for men and 1.08 years for women.

The results of a prospective exercise based on mortality data observed in the first four months of 2021 and mortality forecasts for the period from May to December 2021, indicate that in the 2019-2021 triennium, life expectancy at birth may be 80.83 years, a reduction of 2.76 months compared to 2018-2020, and that life expectancy at age 65 may decrease to 19.44 years, a reduction of 3 months compared to the previous three-year period.

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Statistics Portugal releases the 2018-2020 complete life tables for Portugal, by sex and for the total resident population, providing the official values of life expectancy for the same period.

To assess the impact of excess mortality observed in 2020 and in the first months of 2021 on life expectancy, in this press release, estimates are anticipated for life expectancy at birth and at age 65 for 2019-2021.

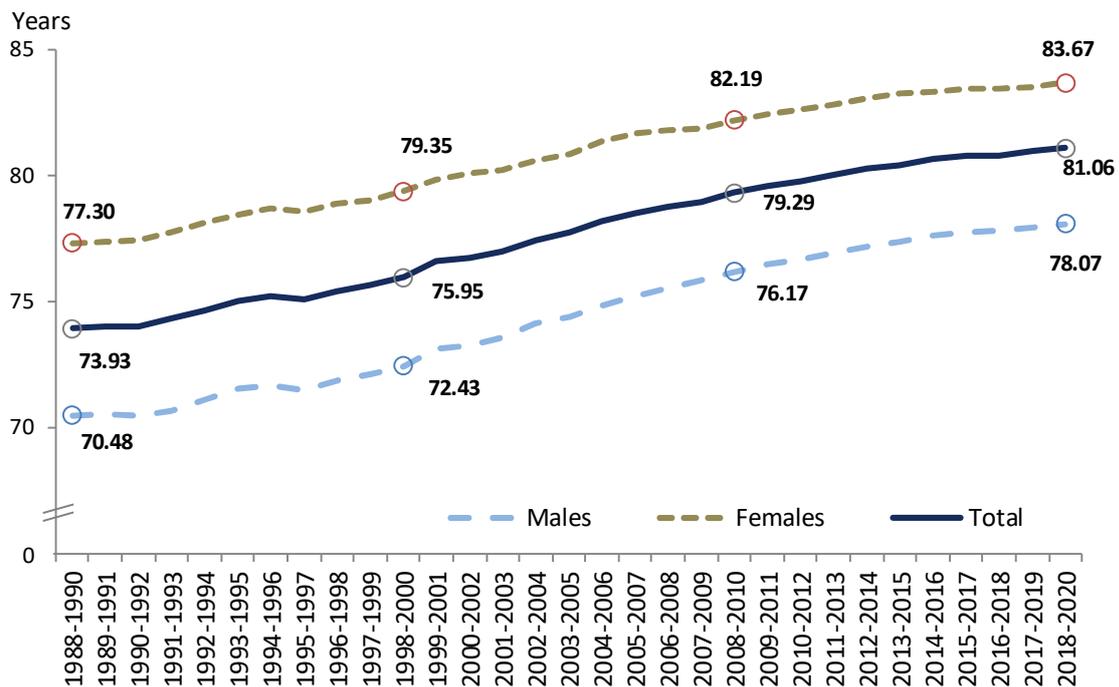
### Life expectancy at birth increased to 81.06 years

Life expectancy at birth for both males and females was estimated at 81.06 years. At birth, men and women could expect to live up to 78.07 years and 83.67 years, respectively. Compared to the estimated values for 2017-2019, it represents an increase of 0.12 years (1.44 months) and 0.16 years (1.92 months), respectively.

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In the last decade, life expectancy at birth in Portugal has increased by 1.77 years, an increase of 1.90 years for males and 1.48 years for females, when compared with the values for 2008–2010 (76.17 and 82.19 years, respectively).

Figure 1.  
Life expectancy at birth, Portugal, 1988-1990 to 2018 – 2020



Source: Statistics Portugal, Complete Life Tables.

The increase in female life expectancy at birth over the last ten years resulted mainly from a reduction in mortality among those aged 60 years and over. For men, the increase in life expectancy at birth continued to be mainly due to the reduction of mortality below 60 years, particularly among those aged 35 to 59<sup>1</sup>.

Women continue to live longer than men, but the gap has been gradually narrowing, from 6.02 years in 2008-2010 to 5.60 years in 2018-2020.

In 2018-2020, it is estimated that 38.3% of male live births and 59.1% of female live births will survive to age 85 if they experience the respective age-specific mortality rates of this time period for the rest of their life. In 2008-2010, these values were, respectively, 31.0% and 51.9%, for men and women<sup>2</sup>.

<sup>1</sup> Results based on the decomposition of the difference in life expectancy at birth between 2008-2010 and 2018-2020 (see technical note).

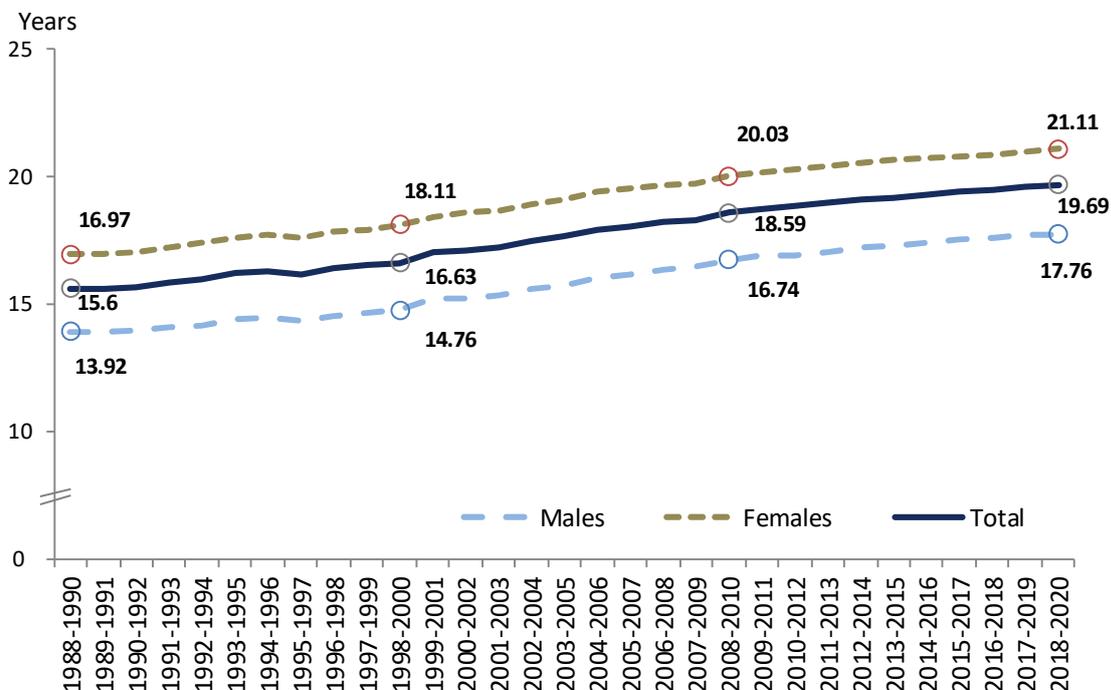
<sup>2</sup> Values are taken from the survival function ( $l_x$ ) of the life table (see technical note).

### Life expectancy at age 65 increased to 19.69 years

Life expectancy at age 65 attained 19.69 years for the total population, 17.76 years for men and 21.11 for women. In 2018-2020 the increase in life expectancy at age 65 was 0.08 years (0.96 months) for the total population, 0.06 years (0.72 months) for men and 0.11 years (1,32 months) for women, compared to the estimated values for the period 2017-2019.

Over the last ten years, life expectancy at age 65 has risen by 1.02 years for males and by 1.08 years for females. In 2018-2020 the difference in life expectancy at age 65 between men and women was 3.35 years.

Figure 2.  
Life expectancy at age 65, Portugal, 1988-1990 to 2018-2020



Source: Statistics Portugal, Complete life tables.

In 2018-2020, most of deaths (66.2%) occurred among those aged 80 years and over. Approximately half of deaths for men (56.1%) and about three quarters for women (75.7%) concentrated in that age group. The most common age at death was 85 for men, the same registered ten years ago, and 88 years for women, one year above that registered ten years ago<sup>3</sup>.

<sup>3</sup> Death values considered here are taken from the life table function dx (see technical note).



### Estimates for the life expectancy at birth and at age 65 for 2019-2021 based on 2021 mortality forecasts

The complete life tables for Portugal for 2018-2020, now published, do not yet reflect the totality of the effects of mortality in 2020. Thus, the impact of the increase in mortality registered in Portugal in 2020, as a result of the pandemic COVID-19, will only be felt in full in the complete life tables for 2019-2021.

In this press release, Statistics Portugal puts forward the results of a **prospective estimation exercise of life expectancy at birth and at age 65 for the 2019-2021 triennium**, using the current calculation methodology of complete life tables for Portugal and preliminary data on deaths for January to April 2021 and death forecasts for the months of May to December 2021 (see technical note).

The following table summarizes the estimates of life expectancy at birth and at age 65 projected for the total population resident in Portugal in the period 2019-2021, and the corresponding 95% prediction intervals.

Figure 3.

Estimates for life expectancy at birth and at age 65, Portugal, 2019-2021

Age (years)	Point estimate	95% Prediction interval	
		Lower limit	Upper limit
0	80.83	80.56	81.03
65	19.44	19.26	19.58

Source: Statistics Portugal, Complete life tables (prospective exercise).

Life expectancy at birth is estimated to may be 80.83 years in 2019-2021, a reduction of 0.23 years (2.76 months) compared to 2018-2020. It is also estimated that life expectancy at age 65 may decrease to 19.44 years in 2019-2021, a reduction of 0.25 years (3 months) compared to the 2018-2020 period.



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## TECHNICAL NOTE

### Complete life table for Portugal 2018-2020

The life table is a mathematical model of demographic analysis composed by a set of functions which provide a basis for measuring longevity in a given population and for making probabilistic judgments about the evolution of mortality with age and time. It is based on age-specific probabilities of dying estimates obtained from the observed number of deaths and the estimated population exposed to the risk of death in a given period of time, for which it is a period life table. Thus, the life table functions represent the experience of a hypothetical cohort of 100,000 live births (called the radix of the table) through their entire life under the assumption that they are subject to the observed schedule of age-specific mortality rates in a given period of time. The life table for Portugal is referred to as a complete since it contains data for every single year of age from birth to the last applicable age.

The functions of the complete life table are:

- Probability of dying ( $q_x$ ): Probability that a person aged  $x$  exactly will die before reaching age  $(x + 1)$ ;
- Survivors at exact age  $x$  ( $l_x$ ): Number of survivors to exact age  $x$  of the initial cohort of 100,000 live births (radix of the table);
- Deaths between the exact ages  $x$  and  $(x + 1)$  ( $d_x$ ): Number of the initial cohort dying between the exact ages  $x$  and  $(x + 1)$ ;
- Person-years lived between exact ages  $x$  and  $(x + 1)$  ( $L_x$ ): Number of person-years lived by the survivors of the initial cohort between exact ages  $x$  and  $(x + 1)$ ;
- Person-years lived above age  $x$  ( $T_x$ ): Total number of person-years lived by survivors after age  $x$ ;
- Life expectancy at age  $x$  ( $e_x$ ): The average number of years a person can expect to live from exact age  $x$ .

The Complete Life Table for Portugal, which is produced annually, has a reference period of 3 years. The probabilities of dying are obtained by the ratio between the number of deaths by age of individuals from two generations (defined by the year of birth) who reach that age in the three consecutive years of reference of the table and the population exposed to the risk of death of those same generations in the same period, which softens the effects on the survival function caused by atypical fluctuations in the population's mortality behaviour. More precisely, in the 2018-2020 table, when calculating the probability of dying at the exact age  $x$ , data on the number of deaths at the exact age  $x$  that occurred in 2018 from generation 2018- $x$  (lower Lexis triangle), the total number of deaths at exact age  $x$  occurred in 2019 (Lexis square), and deaths at exact age  $x$  occurred in 2020 from generation 2020- $x + 1$  (upper Lexis triangle) were considered.

In the most advanced ages (over 85 years), due to the variability in the probabilities of dying at these ages, the method proposed by Denuit and Goderniaux (2005) is applied for smoothing and extrapolation to the last applicable age (closing age of the life table).

Life expectancy at birth, one of the most important longevity indicators provided by the life table, is a well-known summary measure of mortality, widely employed in comparisons through time and between populations. When analysing changes in life expectancy at birth or studying differences in life expectancy between two populations, it is useful to estimate the contributions



of the various age groups that explain them. In the present exercise, the variation of life expectancy values at birth between 2008-2010 and 2018-2020 was analysed using the method proposed by Andreev, E. M., Shkolnikov, V. M., & Begun, A. (2002).

### Complete life table for Portugal 2019-2021 – Prospective exercise

In the prospective estimation exercise of life expectancy at birth and at age 65 for the 2019-2021 triennium, the complete life table for Portugal for 2019-2021 was calculated, according to the methodology described above. To this purpose, data on deaths observed in 2019, 2020 and preliminary data on deaths from January to April 2021 were used. To complement the information necessary for calculation of the life table, univariate time series forecasting methods – seasonal autoregressive integrated moving averages processes,  $SARIMA(p, d, q)(P, D, Q)_s$  – were used to project the total number of monthly deaths from May to December 2021, which were later disaggregated by age and Lexis triangle considering the distribution observed in the previous three-year period. The models were estimated based on the Box-Jenkins methodology using the monthly time series observed in the pre-pandemic period, between 2010 and 2019, thus avoiding the influence on forecasts for the months of May to December 2021 from excess mortality by COVID-19 that occurred in 2020, on the assumption that mortality will return to the behaviour prior to the pandemic. Prediction intervals were also calculated for the forecast at a 95% confidence level and derived prediction intervals for the estimates of life expectancy at birth and at age 65.

### REFERENCES

Andreev, E. M., Shkolnikov, V. M., & Begun, A. (2002). Algorithm for decomposition of differences between aggregate demographic measures and its application to life expectancies, healthy life expectancies, parity-progression ratios and total fertility rates. *Demographic Research*, 7, 499-522.

Denuit, M., & Goderniaux, A. C. (2005). Closing and projecting lifetables using log-linear models. *Bulletin of the Swiss Association of Actuaries*, 1, 29-49.

### DEFINITIONS

**Life expectancy at birth:** The mean number of years that a newborn child can expect to live if subjected throughout his life to the current mortality conditions (age specific probabilities of dying).

**Life expectancy at age 65:** The mean number of years still to be lived by a person who has reached the exact age 65, if subjected throughout the rest of his life to the current age specific probabilities of dying.

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Detailed methodological information available at: [www.ine.pt](http://www.ine.pt), option Products, Metadata system.

Detailed statistical information available at: [www.ine.pt](http://www.ine.pt), option Products, Statistical data, database, theme Population, Subtheme Mortality and life expectancy.